DECENTRALIZED MARKETPLACE USING BLOCKCHAIN

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

Use Case Report

submitted by

Mirza Nikhath Fathima

(22510A05B0)

Under the guidance of

Mr. A. Prashant, Asst. Prof.

Department of Computer Science and Engineering

Prasad V Potluri Siddhartha Institute of Technology

(Permanently affiliated to JNTU-Kakinada, Approved by AICTE)

(An NBA & NAAC accredited and ISO 9001:2015 certified institute)

Kanuru, Vijayawada-520 007

2024-25

Prasad V Potluri Siddhartha Institute of Technology

(Permanently affiliated to JNTU-Kakinada, Approved by AICTE)

(An NBA & NAAC accredited and ISO 9001:2015 certified institute)

Kanuru, Vijayawada-520 007

CERTIFICATE

This is to certify that the Use Case report entitled **"DECENTRALIZED MARKETPLACE USING BLOCKCHAIN"** that is being submitted by **M.Nikhath Fathima (22501A05B0)**, as part of Assignment-1 and Assignment-2 for the **Blockchain Technology(20CS4601C)** course in **3-2** during the academic year **2024-25**.

Course Coordinator
Mr. A. Prashant
Assistant Professor,
Department of CSE,
PVPSIT, Vijayawada

Head of the Department
Dr. A. Jayalakshmi,
Professor and Head,
Department of CSE,
PVPSIT, Vijayawada

MARKS
ASSIGNMENT-1: ____/5
ASSIGNMENT-2: ____/5

INDEX

1. INTRODUCTION

The Decentralized Marketplace is a blockchain-powered platform that enables users to buy, sell, and transfer ownership of digital assets in a secure and transparent manner. Built using React.js for the frontend and Ethereum smart contracts for the backend, this application ensures a trustless and intermediary-free trading experience [1]. By leveraging MetaMask for authentication and Ethers.js for blockchain interactions, users can seamlessly manage their assets on the Ethereum network. The decentralized nature of the system removes reliance on a central authority, ensuring users maintain full control over their transactions [2].

One of the key features of this project is the ability for users to list items for sale by specifying the name and price in ETH. The smart contract securely stores this information and ensures that transactions follow blockchain protocols. Once an item is listed, other users can view and purchase available items directly using cryptocurrency, eliminating the need for third-party payment processors [3]. The use of smart contracts automates transactions, reducing the risk of fraud and making the process more efficient.

Security and transparency are at the core of this marketplace. Each transaction is recorded on the Ethereum blockchain, ensuring immutability and preventing fraud. Ownership details are stored on-chain, allowing buyers to verify asset history before making a purchase [4]. Additionally, users can transfer ownership of purchased items to another Ethereum address, making it easy to trade assets beyond initial transactions. The use of decentralized ledger technology (DLT) enhances security by eliminating the risks associated with centralized databases.

This project showcases the potential of blockchain technology in revolutionizing online marketplaces by providing a decentralized, secure, and efficient method of buying and selling digital goods [5]. With smart contracts automating transactions and removing intermediaries, the platform offers a trustless and permissionless environment where users have full control over their assets.

2.BACKGROUND

The use of blockchain for online marketplaces presents a revolutionary approach to buying and selling digital assets. However, despite its advantages, blockchain-based marketplaces face several challenges that need to be addressed for widespread adoption. Below are the key obstacles in this domain:

2.1 Integration with Existing E-commerce Systems

Many businesses and online marketplaces still operate on traditional centralized platforms. Transitioning from these legacy systems to a blockchain-based marketplace requires significant technical changes, making integration complex and costly. Additionally, resistance to blockchain adoption may arise due to high initial investment, lack of expertise, and the need for businesses to modify their operational models [1].

2.2 Transaction Costs and Scalability

Blockchain networks often experience high gas fees, especially during network congestion. These transaction costs can make small or frequent purchases inefficient for users [2]. Additionally, public blockchains may struggle with scalability as an increase in users and transactions can lead to slower processing times and increased costs [3]. Ensuring a balance between decentralization, cost- effectiveness, and scalability remains a major challenge for blockchain-based marketplaces.

2.3 Regulatory and Legal Uncertainty

Blockchain-based marketplaces operate across global jurisdictions, each with different regulations regarding digital assets, taxation, and consumer protection. The lack of a clear legal framework for decentralized transactions can create compliance challenges [4]. Governments and regulatory bodies may impose restrictions on blockchain-based transactions, affecting the widespread adoption of decentralized marketplaces.

2.4 Trust and Reputation Management

In traditional marketplaces, platforms act as intermediaries to resolve disputes and ensure fair transactions. In a decentralized marketplace, trust is built through smart contracts and peer-to-peer reputation systems [2]. However, ensuring fair dispute resolution and protecting users from fraud remain significant challenges. Implementing decentralized identity verification and rating mechanisms can help enhance trust among buyers and sellers [3].

2.5 Energy Consumption and Sustainability

Some blockchain networks, particularly those using Proof-of-Work (PoW) consensus mechanisms, consume large amounts of energy [4]. This raises concerns about the environmental impact of blockchain-based marketplaces. As sustainability becomes a priority, transitioning to energy- efficient blockchain solutions like Proof-of-Stake (PoS) can help address these concerns [5].

2.6 Data Privacy and Transparency Balance

While blockchain ensures transparency by recording transactions on a public ledger, businesses and users may need to protect sensitive data such as purchase history, personal information, or pricing strategies [1]. Striking a balance between transparency and privacy through privacy-focused blockchain solutions and zero-knowledge proofs is essential for wider adoption [3].

2.7 Cross-Platform and Multi-Blockchain Compatibility

Different blockchain networks have varying standards, making interoperability between them a challenge [2]. A decentralized marketplace must support multiple blockchain ecosystems to maximize its reach. Ensuring seamless cross-platform functionality and multi-chain support can enhance the efficiency and adoption of decentralized marketplaces [4].

3. BLOCKCHAIN BASICS

Blockchain technology is revolutionizing online marketplaces by offering transparency, security, and decentralization. Traditional marketplaces rely on intermediaries for transactions, which can introduce inefficiencies and high costs. Blockchain eliminates the need for third-party oversight, ensuring a more trustless, efficient system. Below are key blockchain concepts relevant to marketplace applications.

3.1 Decentralization

- In a decentralized marketplace, users transact directly with one another without a central authority controlling platform [1].
- This reduces dependency on intermediaries, lowering transaction costs and increasing system reliability [1].
- Peer-to-peer (P2P) networks in decentralized marketplaces ensure uninterrupted access even if a central server fails.

3.2 Immutability

- Immutability means that once data is recorded in the blockchain, it cannot be altered or deleted. This ensures transaction records remain tamper-proof, enhancing buyer and seller trust [2].
- In the marketplace, order histories, product authenticity, and user reviews stored on a blockchain remain permanent and verifiable [2].

3.3 Smart Contracts

- Smart contracts are self-executing contracts with predefined rules coded into them. They automate transactions and enforce agreements without manual intervention [3].
- Smart contracts can facilitate automated refunds in case of order cancellations.
- Example: In a blockchain-based marketplace, a smart contract can automatically release payment to a seller once the buyer confirms receipt of goods, reducing disputes and fraud [3].

3.4 Key Components of Blockchain

3.4.1 Blocks: Each block contains transaction details, a timestamp, and a reference (hash) to the previous block, ensuring a secure transaction history [1].

3.4.2 Consensus Mechanisms: Marketplaces use consensus protocols like Proof of Stake (PoS) to validate transactions and prevent fraud [2].

- **Proof of Stake (PoS)**: More efficient and widely adopted in modern blockchain networks like Ethereum 2.0 [3].
- **Proof of Work (PoW)**: Used in Bitcoin but is energy intensive.
- **Delegated Proof of Stake (DPoS)**: Allows users to vote for delegates who validate transactions, improving scalability.
- **Byzantine Fault Tolerance (BFT)**: Ensures security in decentralized networks by allowing consensus even with some malicious actors.

3.4.3 Tokens: Many blockchain marketplaces use native tokens for payments, rewards, or governance. These can be fungible (cryptocurrencies) or non-fungible tokens (NFTs) [3].

3.4.4 Public **and Private Keys**: Transactions require cryptographic keys, public keys act as user addresses, while private keys provide security and control over assets [2].

3.5 Key Advantages of Blockchain Technology

3.5.1 Trust and Transparency: Transactions recorded on a public ledger prevent data manipulation and fraudulent activities [1].

3.5.2 Lower Fees: Eliminating intermediaries significantly reduces processing fees, benefiting both buyers and sellers [2].

3.5.3 Security: Cryptographic hashing and decentralization make blockchain marketplaces highly resistant to hacks and fraud [3].

3.5.4 Ownership and Provenance: NFTs on blockchain marketplaces allow digital goods (e.g., art, collectibles, and virtual assets) to be uniquely owned and traded with verified authenticity [3].

3.5.5 Enhanced Payment Options: Cryptocurrency transactions enable cross- border

payments with minimal fees and faster processing times.

3.5.6 Fraud Prevention: Blockchain's transparent and immutable nature minimizes counterfeiting and identity theft risks.

3.5.7 Faster Settlements: Blockchain transactions are settled in real-time, eliminating delays in payment processing.

3.5.8 Censorship Resistance: No central authority can restrict access to blockchain-based marketplaces.

3.6 Use Cases of Blockchain in Marketplaces

3.6.1 E-Commerce: Decentralized marketplaces enable peer-to-peer product sales without relying on centralized platforms like Amazon or eBay [1].

3.6.2 NFT Marketplaces: Platforms like OpenSea and Rarible allow users to buy, sell, and trade digital collectibles and artwork using blockchain [2].

3.6.3 Real Estate: Tokenized property ownership and smart contract-based transactions simplify property buying and selling [2].

3.6.4 Content Monetization: Blockchain allows content creators to receive direct payments from consumers without intermediaries.

3.6.5 Supply Chain Marketplaces: Blockchain enhances transparency in product sourcing and supply chain management.

3.6.6 Gaming Marketplaces: Play-to-earn and blockchain-based gaming economies allow players to trade in-game assets securely.

4 USE CASE OVERVIEW

The decentralized marketplace system leverages Ethereum-based smart contracts to facilitate secure, transparent, and direct transactions between buyers and sellers, eliminating intermediaries. All product listings, purchases, and payments are immutably recorded on the blockchain, ensuring trust and prevention of fraud. Sellers list products, while buyers browse and purchase using cryptocurrency. Payments are instantly transferred to sellers, reducing delays. With lower fees, automation, and tamper-proof records, the system enhances efficiency, security, and global accessibility in digital commerce.[7][8]

This case describes the implementation of a decentralized marketplace system that leverages Ethereum-based smart contracts to facilitate direct transactions between sellers and buyers. The system eliminates intermediaries and enhances transparency, security, and trust in digital commerce.[9]

4.1 Objectives

The primary objectives of this decentralized marketplace system are:

- **4.1.1 Eliminate Intermediaries**: Enable direct transactions between buyers and sellers without the need for third-party intermediaries.
- **4.1.2 Enhance Security**: Utilize Ethereum smart contracts to ensure secure, immutable, and transparent transactions.
- **4.1.3 Increase Transparency**: Record all transactions on the blockchain, making them verifiable and tamper-proof.
- **4.1.4 Automate Transactions**: Implement self-executing smart contracts that automatically enforce transaction conditions.
- **4.1.5 Reduce Costs**: Lower transaction fees by removing the need for centralized payment processors or platforms.
- **4.1.6 Improve Trust**: Ensure that transactions are reliable and trustless, removing the necessity for users to rely on a central authority.
- **4.1.7 Data Integrity**: Prevent data manipulation and fraud by storing product and transaction details on a distributed ledger.

4.2 Scope

The decentralized marketplace system covers the following functionalities:

4.2.1 Product Creation: Sellers can list products in the marketplace by providing essential details like name, price, and ownership.

4.2.2 Product Purchase: Buyers can browse and purchase products directly using cryptocurrency.

4.2.3 Automated Transactions: Smart contracts ensure payment transfers and ownership updates.

4.2.4 Access Control: Sellers and buyers have distinct roles with predefined permissions.

4.2.5 Event Logging: The system records all product listings and purchases using blockchain events

4.2.6 Secure Transactions: Payments are conducted in cryptocurrency (Ether), ensuring security and transparency.

4.3 Stakeholders Involved:

The key stakeholders in the decentralized marketplace system include:

4.3.1 Sellers

- I can create, read, and update product listings.
- Receive payment in cryptocurrency upon a successful sale.
- Manage their products through a blockchain-based interface.

4.3.2 Buyers

- You can browse and purchase products listed on the marketplace.
- Use cryptocurrency to complete transactions.
- Gain ownership of the purchased product after a successful transaction.

4.3.3 Smart Contract System

- Acts as an intermediary to facilitate secure transactions.

- Ensures automatic fund transfers and ownership updates.
- Records all events (product creation, purchase) on the blockchain.

4.3.4 Ethereum Blockchain Network

- Provides a decentralized infrastructure to store and execute smart contracts.
- Ensures data immutability and transaction transparency.

4.3.5 Developers

- Responsible for implementing and maintaining the smart contract code.
- Ensure proper security mechanisms are in place.

4.4 Architecture

The decentralized marketplace system follows a smart contract-based architecture with the following components:

4.4.1 Ethereum Smart Contract

- A single smart contract manages product listings and purchases.
- Implements two key functions: CreateProduct and PurchaseProduct.
- Ensures automation, transparency, and security in transactions.

4.4.2 Product Data Structure

- The Product struct stores essential product details, including:
    - id (unique identifier)
    - name (product name)
    - price (listed price in cryptocurrency)
    - owner (Ethereum address of the seller)
    - purchased (status flag)

4.4 .3 Event Mechanism

- **ProductCreated** events notify buyers when a product is listed.
- **ProductPurchased** event confirms a successful purchase.

4.4.4 Access Control Layer

- **Sellers**: Can add and update products.
- **Buyers**: Can only view and purchase products.

4.4.5 Payment Handling

- Payments are processed in Ether (ETH).
- Funds are automatically transferred from the buyer to the seller upon purchase.
- The contract ensures the buyer has sufficient funds before executing the transaction.

4.4.6 Blockchain Storage

- All product details and transaction records are stored immutably on the blockchain.
- No data can be altered once recorded.

4.4.7 Frontend Interface

- Users interact with the marketplace via a decentralized application (DApp).
- Use Web3.js or Ethers.js to connect with the Ethereum smart contract.

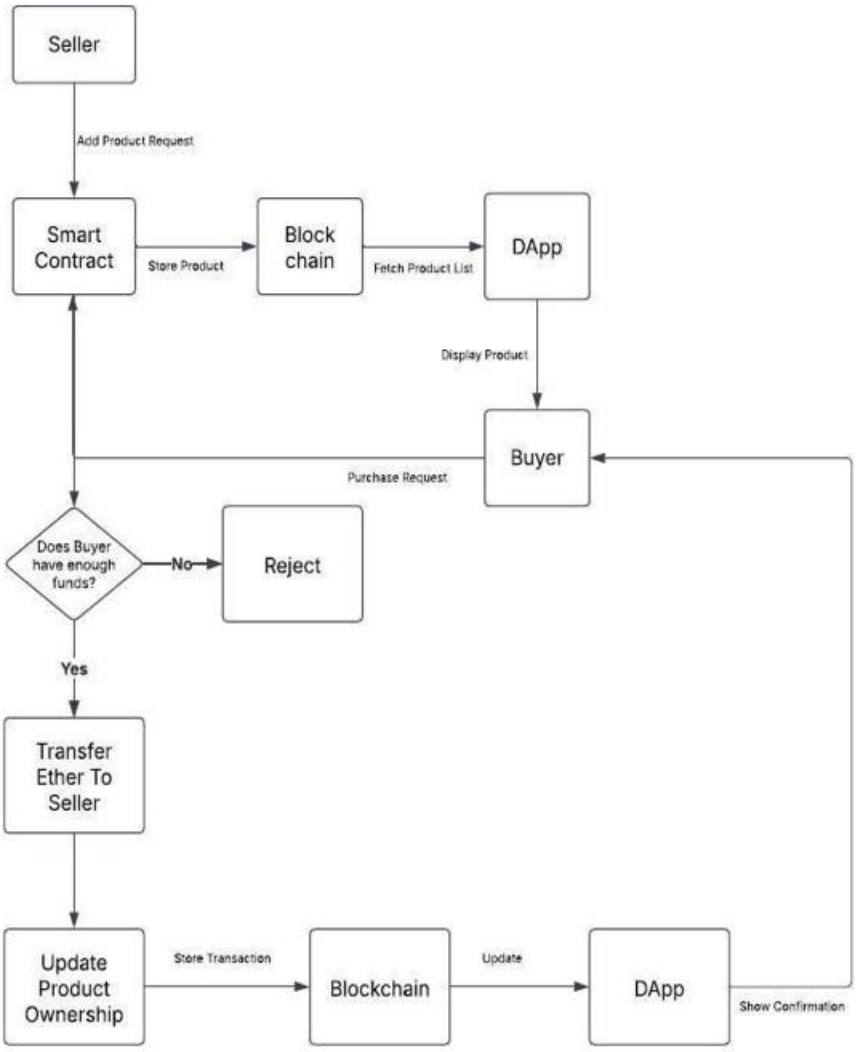

Fig. 4.1: Flow Chart of decentralized marketplace system

Fig. 4.1 depicts the workflow of a decentralized marketplace system, where sellers list products via a smart contract, which stores details on the blockchain. Buyers access product listings through a DApp and submit purchase requests. The system checks if the buyer has sufficient funds—if not, the request is rejected. If funds are available, Ether is transferred to the seller, and product ownership is updated on the blockchain.

4.5 Security and Privacy

Security and privacy are critical aspects of the decentralized marketplace system. The system incorporates the following measures:

4.5.1 Smart Contract Security

- **Require Statements**: Input validation is enforced in functions to prevent invalid transactions.
- **Ownership Verification**: Ensures only the rightful owner can modify or sell products.

4.5.2 Payment Security

- Transactions are conducted in **Ether**, ensuring secure and irreversible payments.
- Funds are transferred only after meeting all purchase conditions.

4.5.3 Data Privacy

- No personally identifiable information (PII) is stored on the blockchain.
- Only necessary product and transaction data are recorded.

4.5.4 Blockchain Immutability

- All records are permanent and tamper-proof.
- Reduces fraud and unauthorized modifications.
-

4.6 Benefits

The decentralized marketplace system provides various advantages:

4.6.1 Transparency

- Every transaction is recorded on the blockchain, ensuring full transparency for buyers and sellers.

4.6.2 Security

- The system removes central points of failure, reducing risks of data breaches or hacking.

4.6.3 Decentralization

- Eliminates the need for a trusted third party, allowing direct peer-to-peer transactions.

4.6.4 Automation

- Smart contracts automatically enforce and execute transactions without manual intervention.

5 IMPLEMENTATION

5.1 Define the Market Place Workflow:

- **Buyer Selects Product** → Smart contract verifies & processes payment
- **Ownership Updates** → Transaction recorded on blockchain
- **UI Updates** → Buyer sees confirmation
- **Seller Adds Product** → Smart contract stores details

5.2 Choose the Blockchain Type:

- **Public Blockchain (Ethereum, Polygon, Binance Smart Chain)** – Decentralized and transparent but may have high gas fees.

5.3 Design Smart Contracts for the Marketplace:

The marketplace's smart contract must include:

- **Product Struct** – Defines product details such as ID, name, price, seller, and purchase status.
- **CreateProduct Function** – Allows sellers to list new products.
- **PurchaseProduct Function** – Facilitates secure purchases by verifying price and ownership.
- **Events** – Notifies users when a product is added or purchased.
- **Access Control** – Ensures only authorized users can perform actions (e.g., only buyers can purchase).

5.4 Develop & Deploy Smart Contracts

Example Solidity Code for Supply Chain Tracking:

```
// SPDX-License-Identifier: MIT
pragma solidity ^0.8.0;
```

```
contract Marketplace {
   uint public productCount = 0;
   mapping(uint => Product) public
   products;
   struct Product
      { uint id;
      string name;
      uint price;
      address payable
      owner; bool
      purchased;
   }
   event ProductCreated(uint id, string name, uint price, address payable owner, bool
   purchased); event ProductPurchased(uint id, string name, uint price, address payable owner,
   bool purchased);
   function createProduct(string memory _name, uint _price) public
      { require(bytes(_name).length > 0, "Product name required");
      require(_price > 0, "Price must be greater than zero");
      productCount++;
      products[productCount] = Product(productCount, _name, _price, payable(msg.sender),
      false); emit ProductCreated(productCount, _name, _price, payable(msg.sender), false);
   }
 function purchaseProduct(uint _id) public payable
    { Product memory _product = products[_id];
      require(_product.id > 0 && _product.id <= productCount, "Invalid product");
      require(msg.value >= _product.price, "Insufficient funds");
      require(!_product.purchased, "Product already purchased");
      require(_product.owner != msg.sender, "Cannot buy your own product");
      _product.owner.transfer(msg.value);
      _product.purchased =
      true; products[_id] =
      _product;
      emit ProductPurchased(_id, _product.name, _product.price, payable(msg.sender), true);
   }
}
```

5.5 Integrate IoT & QR Code for Real-Time Tracking

To enhance transparency, IoT devices and QR codes can be integrated:

- Sensors can track real-time product location and update blockchain records.
- Buyers can scan QR codes to verify product authenticity and ownership history via blockchain records.

5.6 Frontend & Web3 Integration

- Tech Stack: React.js, Web3.js/Ethers.js
- Metamask Integration for transactions
- Steps: Load smart contract → Connect wallet → Display & buy products

5.7 Test the Smart Contracts

- Tools: Hardhat, Truffle
- Check for: Security vulnerabilities, gas efficiency

5.8 Deploy on Blockchain

- Testnet: Goerli, Mumbai for testing
- Mainnet: Ethereum, Polygon for live use

5.9 Monitor & Maintain

- Track activity with Tenderly, Alchemy
- Optimize UI & gas fees
- Upgrade contracts if needed

5.10 Ensure Compliance & Scalability

- Regulatory Compliance: KYC/AML, GDPR
- Scalability: Layer 2 solutions, IPFS for storage

6 ADVANTAGES

Using blockchain for Market Place transparency and traceability provides several significant advantages, including:

6.1 Enhanced Transparency

- Real-time tracking: Blockchain allows stakeholders to monitor goods in real time, ensuring shared access to accurate information.
- Immutable records: Transactions are permanently stored on the blockchain, preventing alterations and ensuring data integrity.

6.2 Improved Traceability

- End-to-end tracking: Tracks products from raw materials to finished goods, verifying authenticity and reducing supply chain risks.
- Auditability: Provides a verifiable record of all transactions, helping detect fraud and inefficiencies.

6.3 Enhanced Security

- Cryptographic protection: Encryption ensures secure transactions and prevents unauthorized access.
- Distributed ledger: Decentralization eliminates single points of failure, reducing cyber- attack risks.

6.4 Reduced Fraud and Counterfeiting

- Immutable verification: Blockchain prevents fraud by ensuring all transactions are traceable and irreversible.
- Product authenticity: Stakeholders can verify the legitimacy of goods, reducing counterfeiting.

6.5 Better Collaboration

- Shared visibility: All supply chain participants access the same real-time data, improving coordination.
- Smart contracts: Automates payments, shipment releases, and approvals, reducing human intervention.

6.6 Increased Efficiency

- Streamlined processes: Eliminates intermediaries, automates verification, and reduces paperwork.
- Faster transactions: Speeds up payments and approvals, reducing delays in logistics.

6.7 Improved Compliance and Regulatory Reporting

- Data accuracy: Ensures compliance with safety, ethical sourcing, and environmental regulations.
- Simplified auditing: Transparent and consistent data makes compliance checks easier.

6.8 Consumer Trust and Loyalty

- Transparency of sourcing: Provides verifiable proof of ethical sourcing and fair trade practices.
- Product verification: Enables consumers to confirm product authenticity, increasing trust.

6.9 Cost Savings

- Reduced paperwork & intermediaries: Automates processes, cutting administrative costs.
- Minimized fraud losses: Reduces financial losses due to counterfeit goods and fraudulent activities.

6.10 Sustainability

- Environmental impact tracking: Monitors carbon footprint and ethical sourcing of products.
- Waste reduction: Enhances inventory management, preventing overproduction and surplus waste.

6.11 Scalability & Future proofing

- Interoperability: Blockchain can integrate with emerging technologies like AI and IoT for future advancements.
- Adaptability: The decentralized nature allows businesses to scale operations without performance bottlenecks.

7 CHALLENGES

While blockchain offers numerous benefits for Market Place transparency and traceability, there are also several challenges and limitations that organizations may face when adopting this technology. These include:

7.1 High Transaction Costs

- Gas fees: Ethereum and other blockchain networks often have high gas fees, making small transactions expensive.
- Scalability issues: As the number of transactions increases, costs may rise, affecting marketplace efficiency.

7.2 Scalability Limitations

- Network congestion: Public blockchains may experience slow transaction times due to congestion.
- Limited throughput: Traditional blockchains process fewer transactions per second compared to centralized systems.

7.3 Regulatory Uncertainty

- Lack of clear policies: Governments worldwide have different regulations for blockchain- based transactions.
- Compliance challenges: Businesses must ensure adherence to evolving legal frameworks, increasing operational complexity.

7.4 Security Risks

- Smart contract vulnerabilities: Poorly written smart contracts can be exploited, leading to financial losses.
- Phishing & hacking: Users may fall victim to scams and cyber-attacks, risking their assets.

7.5 Complexity in User Adoption

- Technical knowledge required: Many users struggle to understand blockchain and cryptocurrency concepts.
- Difficult onboarding: Setting up wallets and managing private keys can be overwhelming for non-tech-savvy users.

7.6 Lack of Consumer Trust

- Market volatility: Cryptocurrency price fluctuations can make transactions unpredictable.
- Fear of scams: Many users remain skeptical of decentralized marketplaces due to past fraudulent activities.

7.7 Energy Consumption

- High power usage: Proof-of-Work (PoW) blockchains consume significant energy, raising environmental concerns.
- Sustainability challenges: Businesses must consider greener blockchain alternatives like Proof-of-Stake (PoS).

7.8 Limited Interoperability

- Cross-chain issues: Many blockchains operate in silos, limiting seamless interaction between different platforms.
- Integration challenges: Connecting blockchain solutions with traditional systems can be complex and costly.

7.9 Legal and Dispute Resolution Challenges

- Smart contract limitations: Automated transactions may lack mechanisms for resolving disputes efficiently.
- Jurisdictional conflicts: Determining applicable laws for decentralized transactions remains a challenge.

7.10 Resistance from Traditional Industries

- Lack of institutional support: Established businesses may be reluctant to adopt decentralized models.
- Fear of disruption: Companies dependent on intermediaries may resist blockchain-based solutions.

8 CONCLUSION

The integration of blockchain, smart contracts, and IoT in a decentralized marketplace offers numerous advantages, including enhanced transparency, security, efficiency, and cost savings [3][4]. By eliminating intermediaries and leveraging automated processes, blockchain-based marketplaces create a more reliable and trust-driven ecosystem for buyers and sellers [9].

However, challenges such as scalability limitations, regulatory uncertainty, security risks, and high transaction costs must be carefully addressed to ensure widespread adoption [4]. Overcoming these obstacles will require technological advancements, improved regulatory frameworks, and user-friendly solutions to facilitate seamless adoption [7].

Despite these challenges, blockchain-powered marketplaces hold immense potential to revolutionize various industries by enabling real-time tracking, secure transactions, and global accessibility [8]. As blockchain technology continues to evolve, businesses and consumers alike can look forward to a more decentralized, transparent, and efficient marketplace [9].

9 SDG's ADDRESSED

A decentralized marketplace powered by blockchain technology contributes significantly to multiple **United Nations Sustainable Development Goals (SDGs)** by fostering transparency, security, and efficiency while promoting fair trade and economic inclusion. Below are the key SDGs addressed by your decentralized marketplace:

9.1 SDG 1: No Poverty

- Empowering Small Businesses: Provides equal opportunities for small entrepreneurs to sell goods and services globally.
- Lower Transaction Costs: Eliminates intermediaries, ensuring sellers retain more profits.
- Financial Inclusion: Enables unbanked populations to participate in the digital economy through cryptocurrency payments.

9.2 SDG 8: Decent Work and Economic Growth

- Fair and Transparent Trade: Smart contracts ensure fair pricing and timely payments.
- Borderless Market Access: Allows individuals in developing countries to access global buyers.
- Fraud Prevention: Blockchain ensures trust and reduces unfair trade practices**.**

9.3 SDG 9: Industry, Innovation, and Infrastructure

- Decentralized and Scalable Marketplace: Removes reliance on centralized platforms.
- Secure Transactions: Blockchain prevents fraud and ensures data integrity.
- Efficient Trade: Automates payments and contract execution through smart contracts.

9.4 SDG 12: Responsible Consumption and Production

- Transparent Supply Chains: Tracks product origins and ensures ethical sourcing.
- Reduces Counterfeiting: Verifies authenticity of goods through blockchain.
- Efficient Inventory Management: Prevents overproduction and minimizes waste.

10 REFERENCES

1. Ethereum Documentation – https://ethereum.org/en/developers/docs/ (last date of visit:13-03-25)
2. https://www.researchgate.net/publication/363491805_Blockchain-based_Smart_Contract_for_Decentralized_Marketplace (last date of visit:14-03-25)
3. V. P. Ranganthan, R. Dantu, A. Paul, P. Mears, and K. Morozov, "A decentralized marketplace application on the ethereum blockchain," in Proceedings - 4th IEEE International Conference on Collaboration and Internet Computing, CIC 2018, Jun. 2018, pp. 90–97. doi:10.1109/CIC.2018.00023.
4. S. Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System." [Online]. Available: www.bitcoin.org
5. K. Christidis and M. Devetsikiotis, "Blockchains and Smart Contracts for the Internet of Things," IEEE Access, vol. 4. Institute of Electrical and Electronics Engineers Inc., pp. 2292–2303, 2016. doi:10.1109/ACCESS.2016.2566339.
6. L. Wang, X. Shen, J. Li, J. Shao, and Y. Yang, "Cryptographic primitives in blockchains," Journal of Network and Computer Applications, vol. 127, pp. 43–58, Feb. 2019, doi:10.1016/j.jnca.2018.11.003.
7. P. Tasatanattakool and C. Techapanupreeda, "Blockchain: Challenges and applications," in International Conference on Information Networking, Jun. 2018, vol. 2018-January, pp. 473–475. doi:10.1109/ICOIN.2018.8343163.
8. S. Wang, L. Ouyang, Y. Yuan, X. Ni, X. Han, and F. Y. Wang,"Blockchain-Enabled Smart Contracts: Architecture, Applications,and Future Trends," IEEE Transactions on Systems, Man, and Cybernetics: Systems, vol. 49, no. 11, pp. 2266–2277, Jun. 2019, doi:10.1109/TSMC.2019.2895123.
9. K. Wust and A. Gervais, "Do you need a blockchain?," in Proceedings- 2018 Crypto Valley Conference on Blockchain Technology, CVCBT2018, Jun. 2018, pp. 45–54. doi: 10.1109/CVCBT.2018.00011.

11 APPENDIX A

https://drive.google.com/drive/u/0/folders/11TTVZVqNWMt6_o-iiD16by_NHWvVU_0r